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Range extension of *Lygophis meridionalis* (Schenkel, 1901) (Reptilia: Squamata: Dipsadidae: Xenodontinae) to Espírito Santo state, southeastern Brazil

Thiago Marcial de Castro[1, 3] & **Jane C. F. de Oliveira**[2]

[1] Centro Universitário São Camilo, Rua São Camilo de Lellis, 1, Paraíso, 29304-910, Cachoeiro de Itapemirim, ES, Brazil
[2] Departamento de Ecologia, Instituto de Biologia Roberto de Alcantara Gomes, Universidade do Estado do Rio de Janeiro, Rua São Francisco Xavier 524, Maracanã, 20550-019, Rio de Janeiro, RJ, Brazil
[3] Corresponding author. E-mail: thiagomarcial@yahoo.com.br

Abstract: We present the first record of *Lygophis meridionalis* for the state of Espírito Santo, in southeastern Brazil, and a distribution map based on indexed literature. This species of the family Dipsadidae is widely distributed in South America, although records from Brazil are only available for the states of São Paulo, Amazonas, Pará, Goiás, Tocantins, and Bahia. Our report is only the second record of *L. meridionalis* from the Atlantic Forest and represents a range extension of 998 km from the nearest record in this biome.

Key words: Atlantic Rainforest; geographic distribution; snakes; new records; municipality of Linhares; *Liophis lineatus* complex; reptile

Lygophis meridionalis (Schenkel, 1901) is a snake that belongs to the subfamily Xenodontinae Bonaparte, 1845, a monophyletic group (e.g., Grazziontin et al. 2012) in the family Dipsadidae Bonaparte, 1838. The genus *Lygophis* Fitzinger, 1843 was revalidated to include the species of the *L. lineatus* complex, which had previously been allocated to the paraphyletic genus *Liophis* Wagler 1830 (Zaher et al. 2009). This reclassification was supported by subsequent molecular studies (Vidal et al. 2010; Grazziotin et al. 2012; Pyron et al. 2013).

Lygophis meridionalis is found throughout much of southern South America, between southern Argentina, Bolivia, and Paraguay (type locality: Cerrito; Cacciali and Wüest 2009), and Brazil (Dixon 1989), where it is found over a wide area, but typically in disjunct populations restricted to open habitats. This medium-sized (SVL = 356–649 mm) snake (Sawaya et al. 2008; Forlani et al. 2010) is diurnal (Sawaya et al. 2008; França & Braz 2013; Rodrigues et al. 2015), although there have been some observations of nocturnal activity (Forlani et al. 2010). *Lygophis meridionalis* feeds primarily on anuran and fish (Sawaya et al. 2008; Forlani et al. 2010; Rodrigues et al. 2015), probably due to its preference for habitats at the margins of lentic bodies of water (e.g., Sawaya et al. 2008; Arzamendia & Giraudo 2009). This snake breeds seasonally, with vitellogenesis occurring from September through March, coinciding with the period when the species is most active, i.e., the rainy season (Sawaya et al. 2008).

While *L. meridionalis* is abundant and relatively common in central Brazil (Sawaya et al. 2008; Forlani et al. 2010; Freitas et al. 2016), and apparently prefers undisturbed areas (Sawaya et al. 2008), there are very few published data on its geographic distribution. This study reports the distribution extension for *L. meridionalis* for the Atlantic rainforest in southeastern Brazil and present a species' distribution in Brazil based on indexed literature.

We recorded during an inventory of herpetofauna two specimens of *L. meridionalis* in the municipality of Linhares, in northern Espírito Santo, in southeastern Brazil. The study sites are located on a sandy coastal plain, adjacent to the Vale Natural Reserve. The climate is humid tropical (Köppen's *Aw* type), with a mean annual precipitation of 1178 mm (Incaper 2017). The area has strong seasonality with a rainy season from October to March and a dry season from April to September (Kierulff et al. 2014). Specimen collection was authorized under license IEMA No. 020/2016, and the voucher specimen was deposited in the National Atlantic Forest Institute at the Mello Leitão Museum (MBML), Santa Teresa, Espírito Santo, Brazil. For bibliographic data on *L. meridionalus* geographic distribution, we considered only those data published in indexed journals. We performed a search on the following databases: Web of Science, SciELO, Scopus, Google Scholar, and CAPES academic journal. One of the specimens recorded (total length = 640 mm, female, voucher specimen MBML3922) was encountered in an open area, adjacent to the block of forest of the Vale Natural Reserve (–19.1548, –39.8935, datum = WGS84, 12 m above sea level), 200 m

Figure 1. Adult male *Lygophis meridionalis* from Linhares in northern Espírito Santo, southeastern Brazil (MBML3923). Photo: Thiago Marcial de Castro.

from the location of the first specimen, on 10:00 h 16 November 2016. The second specimen (total length = 368 mm, male, voucher specimen MBML3923; Figure 1) was collected at the edge of the block of forest of the Vale Natural Reserve (–19.1519, –39.8911, datum = WGS84, 14 m above sea level) during the day (11:30 h) on 17 November 2016. This snake was foraging on the leaf litter

Identification was made by comparisons of the two specimens' pholidosis with the diagnoses available in the published literature (Dixon 1989; Yuki & Barros 1997). Dixon (1989) defined *L. meridionalis* based on a dorsum with three dark and two narrow yellow stripes, and a median dark stripe beginning on snout. The meristic data were presented in Yuki & Barros (1997): supralabials 8/8,

Table 1. Known geographical distribution of *Lygophis meridionalis* (Schenkel, 1901) in Brazil according to the literature available in indexed journals until February 2017.

Reference	Biome	Locality	State	Latitude	Longitude
Dixon 1989	–	Central Brazil	–	—	—
Yuki & Barros 1997	Amazonian Savannas	Araguaia and Humaitá	Pará and Amazonas	–8.2500 –7.5167	–49.2833 –63.0333
Vitt et al. 2005	Cerrado	Jalapão	Tocantins	–10.4000	–46.7000
França et al. 2006	Amazonian Savannas	Serra do Cachimbo	Pará	–8.2500	–49.2833
Costa et al. 2007	Cerrado	–	–	—	—
França et al. 2008	Cerrado	–	Distrito Federal	–15.7167	–48.1667
Sawaya et al. 2008	Cerrado	Itirapina	São Paulo	–22.1500	–47.8333
Forlani et al. 2010	Atlantic Rainforest	São Miguel Arcanjo and Capão Bonito	São Paulo	–24.0167 –24.1000	–47.9167 –48.0333
França & Braz 2013	Cerrado	Chapada dos Veadeiros	Goiás	–14.0667	–47.3833
Rodrigues et al. 2015	Cerrado	Marajó Island	Pará	–0.9833	–49.7333
Freitas et al. 2016	Cerrado	Cocos	Bahia	–14.1167	–44.6833
Dal Vechio et al. 2016	Cerrado	Estação Ecológica Serra Geral do Tocantins	Tocantins	–8.5333	–46.5333
This study	Atlantic Rainforest	Linhares	Espírito Santo	–19.1519	–39.9078

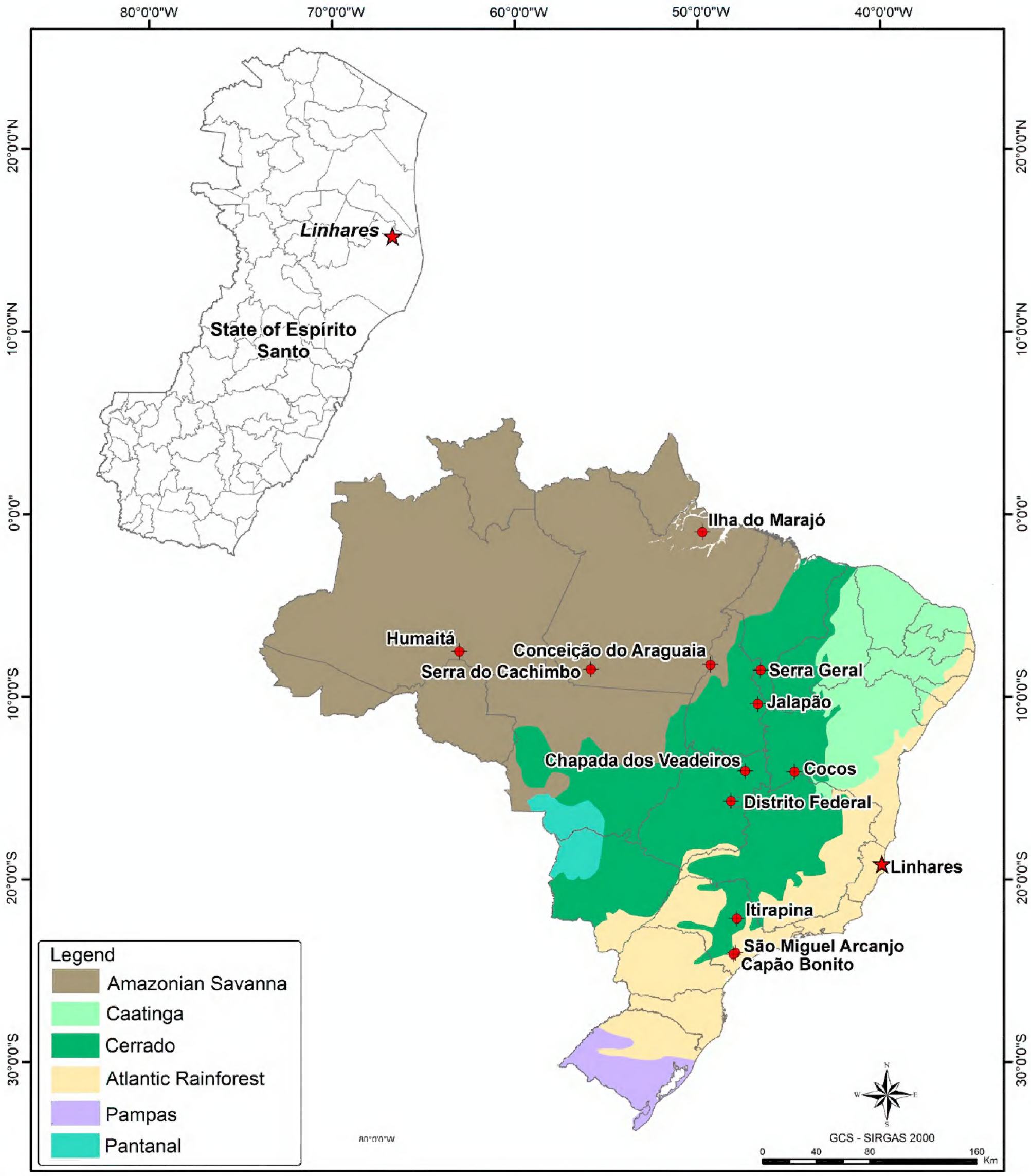

Figure 2. Geographic distribution of *Lygophis meridionalis* in Brazil. Red circles indicate the previous known distribution of *L. meridionalis* in Brazil. The red star indicates the new record of *L. meridionalis* (Linhares, this study).

infralabials 9/10 up to 10/10, pre- and postoculars 1+2/1+2, temporal 1+2+2 up to 1+2+3, dorsal scale rows 19/19/15, ventrals 159 up to 174, subcaudals 78 up to 86.

The characteristics of our two specimens are consistent with those defined by Dixon (1989) and Yuki & Barros (1997). The female specimen (voucher MBML3923) had: supralabials 8/8, infralabials 10/10, pre- and postoculares 1+2/1+2, temporal 1+2+3, dorsal scale rows 19/19/15, ventrals 166, subcaldals 86. The male specimen (voucher MBML3922) had: supralabials 8/8, infralabials 10/10, pre and postoculars 1+2/12, temporal 1+2+3, dorsal scale rows 19/19/15, ventrals 164, subcaldals 84. A specialist from the National Museum in Rio de Janeiro (Gonzalez R.C.) confirmed the species' identification.

We present here the first record of *Lygophis meridionalis* from the state of Espírito Santo, in southeastern Brazil. This represents a range extension of 750 km from the closest record (Municipality of Cocos, Bahia; Cerrado Biome)

and 998 km from the closest record in Atlantic Rainforest (Municipality of Miguel Arcanjo, São Paulo) (Table 1). Our report represents only the second record of *L. meridionalis* from the Atlantic Forest biome of eastern Brazil (Table 1; Figure 2). *Lygophis meridionalis* is relatively abundant in the areas where it occurs and has a broad distribution in parts of South America and Brazil, which suggests that the known disjunct geographical distribution of this species is due to the lack of studies on snakes in Brazil, especially in Espírito Santo. In fact, the records of the species in herpetological collections show that *L. meridionalis* is well represented in inventory studies (http://www.splink.org.br, accessed on 22 February, 2017). Therefore, we reinforce the need for scientific studies to confirm the geographic distribution of the species, especially in the Atlantic Rainforest biome.

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